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(12) **EUROPEAN PATENT APPLICATION**

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(71) Applicant:  
**Mitsui Chemicals, Inc.**  
**Tokyo 100-6070 (JP)**

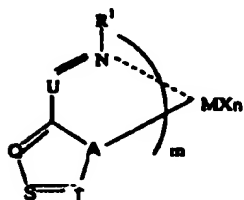
(72) Inventors:  
• **Matsui, Shigekazu**  
**Kuga-gun, Yamaguchi 740-0061 (JP)**

• **Nitabaru, Masatoshi**  
**Kuga-gun, Yamaguchi 740-0061 (JP)**  
• **Yoshida, Yasunori**  
**Kuga-gun, Yamaguchi 740-0061 (JP)**  
• **Mitani, Makoto**  
**Kuga-gun, Yamaguchi 740-0061 (JP)**  
• **Fujita, Terunori**  
**Kuga-gun, Yamaguchi 740-0061 (JP)**

(74) Representative: **HOFFMANN - EITLE**  
**Patent- und Rechtsanwälte**  
**Arabellastrasse 4**  
**81925 München (DE)**

(54) **Olefin polymerization catalyst and process for olefin polymerization**

(57) The present invention provides an olefin polymerization catalyst by the use of which an olefin (co)polymer can be obtained with a high polymerization activity, and also provides a process for olefin polymerization using the catalyst. The olefin polymerization catalyst comprises a transition metal compound (A) represented by the formula (I):



(I)

Q: R<sup>3</sup>-C, N, P  
S: R<sup>4</sup>-C, N, P  
T: R<sup>5</sup>-C, N, P  
m: 2 - 6  
R<sup>1</sup> - R<sup>5</sup>: hydrogen, hydrocarbon group, silicon-containing group or the like (When M is an atom of Group 6, R<sup>1</sup> is not an aromatic hydrocarbon group.)  
n: number satisfying a valence of M  
X: halogen, hydrocarbon group or the like

M: atom of Group 3 to Group 11  
U: R<sup>2</sup>-C, N, P  
A: N, P



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## EUROPEAN SEARCH REPORT

Application Number  
EP 99 12 4058

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| The present search report has been drawn up for all claims   |  |   |   |
| Place of search<br>THE HAGUE   |  | Date of completion of the search<br>20 September 2000 | Examiner<br>Parry, J  |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |  |   |   |

EPO FORM 1503 03.82 (P04C01)



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# EUROPEAN SEARCH REPORT

Application Number  
EP 99 12 4058

| DOCUMENTS CONSIDERED TO BE RELEVANT  |  |   |  |
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| X  | KANUNGO, P. K. ET AL: "Physicochemical studies of lanthanum(III), cerium(III), praseodymium(III), neodymium(III), samarium(III) and gadolinium(III) chelates of o-(2-pyrrolideneimino)benzoic acid and 3-(2-pyrrolideneimino)propionic acid" INDIAN J. CHEM., SECT. A (1977), 15A(12), 1104-5, XP000900060<br>* the whole document * | 1   | TECHNICAL FIELDS SEARCHED (Int.Cl.7)         |
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| The present search report has been drawn up for all claims   |  |   |  |
| Place of search<br>THE HAGUE   |  | Date of completion of the search<br>20 September 2000 | Examiner<br>Parry, J                         |
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## EUROPEAN SEARCH REPORT

Application Number  
EP 99 12 4058

| DOCUMENTS CONSIDERED TO BE RELEVANT  |  |  |  |
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| The present search report has been drawn up for all claims   |  |  |  |
| Place of search<br><b>THE HAGUE</b>  |  | Date of completion of the search<br><b>20 September 2000</b> | Examiner<br><b>Parry, J</b>                  |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |  |  |  |

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# EUROPEAN SEARCH REPORT

Application Number  
EP 99 12 4058

| DOCUMENTS CONSIDERED TO BE RELEVANT  |  |  |   |
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| The present search report has been drawn up for all claims   |  |  |   |
| Place of search<br><b>THE HAGUE</b>  |  | Date of completion of the search<br><b>20 September 2000</b> | Examiner<br><b>Parry, J</b>                         |
| <div> <div> <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone</p> <p>Y : particularly relevant if combined with another document of the same category</p> <p>A : technological background</p> <p>O : non-written disclosure</p> <p>P : intermediate document</p> </div> <div> <p>T : theory or principle underlying the invention</p> <p>E : earlier patent document, but published on, or after the filing date</p> <p>D : document cited in the application</p> <p>L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p> </div> </div> |  |  |   |

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## EUROPEAN SEARCH REPORT

Application Number  
EP 99 12 4058

| DOCUMENTS CONSIDERED TO BE RELEVANT  |  |  |  |   |
|--|--|--|--|---|
| Category   | Citation of document with indication, where appropriate, of relevant passages  | Relevant to claim  | CLASSIFICATION OF THE APPLICATION (Int.Cl.7) |   |
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| The present search report has been drawn up for all claims   |  |  |  |   |
| Place of search<br><b>THE HAGUE</b>  |  | Date of completion of the search<br><b>20 September 2000</b> | Examiner<br><b>Parry, J</b>                  |   |
| <p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |  |  |  |   |

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## EUROPEAN SEARCH REPORT

Application Number  
EP 99 12 4058

| DOCUMENTS CONSIDERED TO BE RELEVANT   |  |   |  |
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| The present search report has been drawn up for all claims  |  |   |  |
| Place of search<br>THE HAGUE  |  | Date of completion of the search<br>20 September 2000 | Examiner<br>Parry, J                         |
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#### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

#### LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number  
EP 99 12 4058

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

**1. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 3 of the periodic table of elements wherein the ligands are not bonded to each other via R.

**2. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 4 of the periodic table of elements wherein the ligands are not bonded to each other via R.

**3. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 5 of the periodic table of elements wherein the ligands are not bonded to each other via R.

**4. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 6 of the periodic table of elements wherein the ligands are not bonded to each other via R.

**5. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 7 of the periodic table of elements wherein the ligands are not bonded to each other via R.

**6. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 8 of the periodic table of elements wherein the ligands are not bonded to each other via R.

**7. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 9 of the



The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

periodic table of elements wherein the ligands are not bonded to each other via R.

8. Claims: 1-4 (in part)

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 10 of the periodic table of elements wherein the ligands are bonded to each other via R.

9. Claims: 1-4 (in part)

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 11 of the periodic table of elements wherein the ligands are bonded to each other via R.

10. Claims: 1-4 (in part)

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 3 of the periodic table of elements wherein the ligands are bonded to each other via R.

11. Claims: 1-4 (in part)

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 4 of the periodic table of elements wherein the ligands are bonded to each other via R.

12. Claims: 1-4 (in part)

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 5 of the periodic table of elements wherein the ligands are bonded to each other via R.

13. Claims: 1-4 (in part)

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 6 of the periodic table of elements wherein the ligands are bonded to each other via R.



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**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number  
EP 99 12 4058

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

**14. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 7 of the periodic table of elements wherein the ligands are bonded to each other via R.

**15. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 8 of the periodic table of elements wherein the ligands are bonded to each other via R.

**16. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 9 of the periodic table of elements wherein the ligands are bonded to each other via R.

**17. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 10 of the periodic table of elements wherein the ligands are bonded to each other via R.

**18. Claims: 1-4 (in part)**

The subject matter of claims 1-4 insofar they relate to complexes comprising transition metals of group 11 of the periodic table of elements wherein the ligands are bonded to each other via R.

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 12 4058

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82